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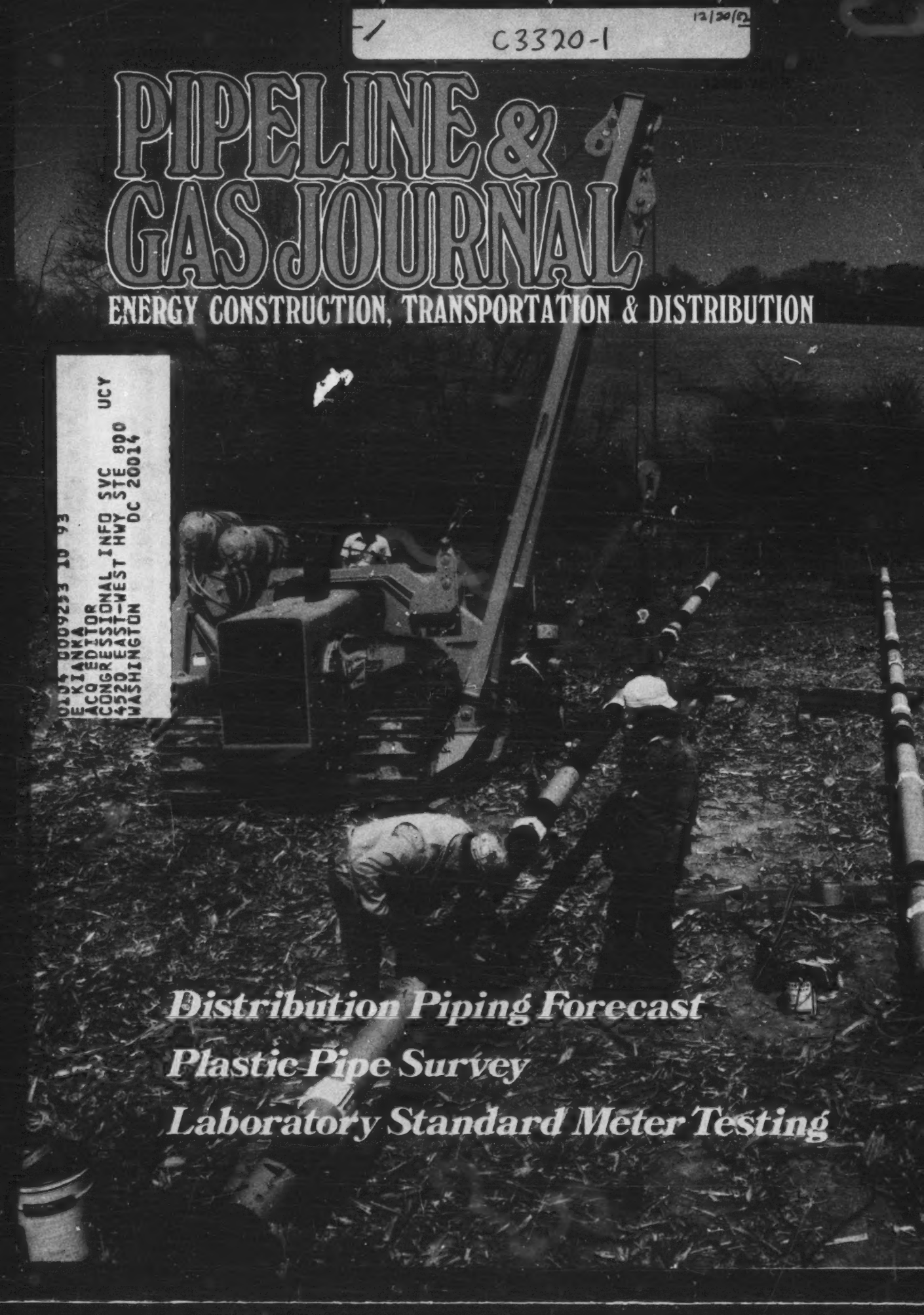

Distribution Piping Forecast

Plastic Pipe Survey

Laboratory Standard Meter Testing

PIPELINE & GAS JOURNAL

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Jack Johnson, contractor, featured in this issue (page 33), is a believer in new equipment innovations, such as this hydraulic sideboom with only three controls that can quickly handle pipe in the field.

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Iowa contractor who specializes in distribution piping and small pipeline installations – and unique projects such as tile replacement where big-inch lines go through farm country – is always ready to try "something new."

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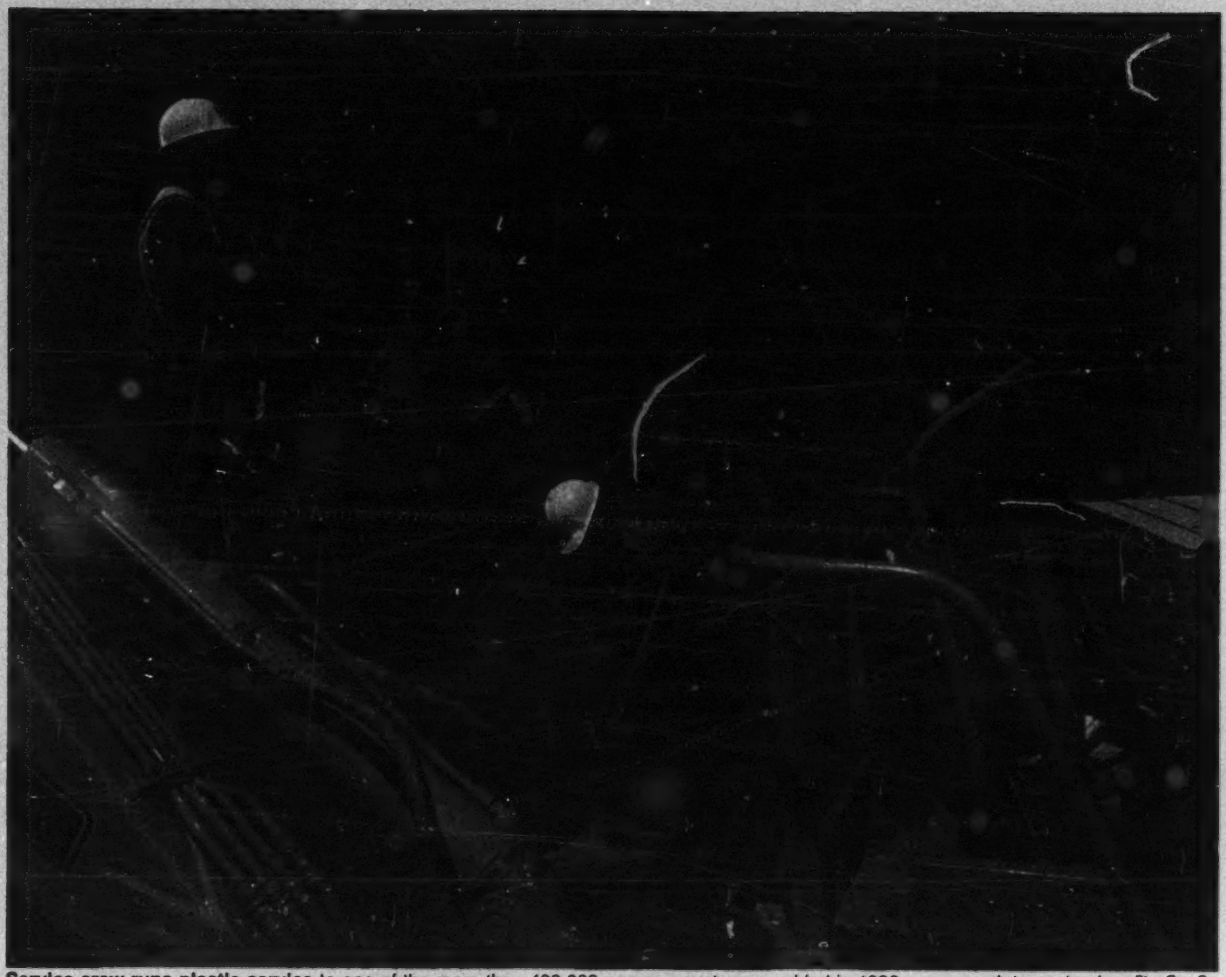

Service crew runs plastic service to one of the more than 400,000 new gas customers added in 1982. *photos courtesy Lone Star Gas Co.*

Distribution Piping Expenditures Of $2.66 Billion Seen For 1983

by Jim Watts, *Assistant Editor*

Gas distribution utilities in the U.S. will spend a record $2,661,854,500 in 1983 on system expansion, replacement, and maintenance to add another 25,767 miles of piping to the nation's 1.381 million mile natural gas distribution network.

If projections of the gas distribution utility executives polled in PIPELINE & GAS JOURNAL's 17th annual distribution survey hold true, 1983 will be a record year for distribution capital expenditures – up 11.6% from 1982 and 9.6% more than 1981. The amount of piping installed will be 8.4% more than 1982's 23,610 miles but 7.8% less than the 27,952 miles installed in 1980.

The estimates for 1982 contained in the December 1981 survey results proved to be too optimistic, as the housing construction slump lasted through the year. Many survey respondents this time noted almost no housing construction in their area. Last year, estimates were for expenditures of $2.65 billion and installation of 25,167 miles, but the actual figures were $2.352 billion in capital expenditures and installation of 23,609 miles, declines of 11.2% and 6% respectively.

In 1982, U.S. gas distribution utilities spent $1,503,734,000 on new and replacement mains and services and $848,819,350 on maintenance of the system. Gas main installations totaled 11,268 miles and 12,341 miles of services were installed. The 1983 projections are for expenditures of $1,735,884,100 for new and replacement mains and service lines and $925,970,400 for maintenance. An estimated 13,506 miles of mains and 12,261 miles of service lines will be installed in 1983.

The inflationary pressures on gas distribution piping costs seem to have

Not all distribution piping is small-inch: here a Lone Star Gas crew installs a 24-in. distribution main.

Gas Distribution Utility Expenditures

	1981	1982	1983 est.
New and replacement mains and service lines	$1,524,783,000	$1,503,734,000	$1,735,884,100
Maintenance of system	881,475,480	848,819,350	925,970,400
TOTALS	$2,406,258,480	$2,352,553,350	$2,661,854,500

Gas Distribution Utilities Pipe Installed, Miles

	1980	1981	1982	1983 est.
Gas mains	13,573	11,535	11,268	13,506
Gas service lines	14,379	13,188	12,341	12,261
TOTALS	27,952	24,723	23,609	25,767

Gas Distribution Utilities – Pipe Installed – Total Miles "In Ground" As Of 12-31-82

Gas mains	842,991
Gas service lines	537,942
TOTAL	1,380,933

eased. 1983 projections are for an 11.6% increase in costs and an 8.4% increase in piping mileage. In 1982, mileage installed was down 4.5% compared to 1981, but costs were down only 2.24%.

Maintenance as a percentage of the total construction budget has been steady over the past three years – 36.6% in 1981, 36.1% in 1982, and an estimated 34% in 1983. The amount spent for system maintenance upgrading rose an astonishing 40% from 1980 to 1981, but has leveled off with a decline of 3.7% from 1981 to 1982 and an increase of 9% from 1982 to 1983's estimate.

Approximately 427,000 customers were added by gas utilities in 1982, close to the 500,000 new customers estimated in the 1982 projections last year. Of those new customers, 98,462 are conversions from oil or electric heating and 263,770 are attributed to new construction. The record year for new customers was 1980, when 685,000 customers were added.

The outlook for additional customers is somewhat murky in 1983. The pricing advantage gas enjoyed over oil and electric heating has been evaporating, and with gas price deregulation set for Jan. 1, 1985, many potential customers are apparently waiting to see what will happen. The convenience and cleanliness of gas heating is still an important factor, however, and if housing construction picks up again by mid-year 1983 could be a very good year for gas utilities.

By the end of 1982, the U.S. gas distribution network will total 842,991 miles of gas mains and 537,942 miles of service lines, totaling 1,380,993 miles of distribution piping serving an estimated 49.8 million customers.

Data for the 1982 results and 1983 projections of expenditures and pipe mileage was compiled in a survey of 500 gas distribution utilities in 50 states, including the 300 largest gas distribution utilities as reported in THE P&GJ 500, August 1983 issue.

Maintenance Vs. Construction

Along with projections on piping mileage and expenditures, P&GJ asked for projections and opinions on how the current economic situation is affecting maintenance and construction budgets. Comments included:

"Revenue producing extensions are still down because of slump in housing construction."

"Main extensions and new services have been greatly reduced."

"We are receiving lower bid prices on contracted work."

"We have reduced and eliminated outside contractors."

"Very little new construction is planned. Our maintenance programs have been cut back 75%, and we are doing just what we have to."

"Decrease in new housing construction has had a significant effect in customer acquisition. The economy has also affected the oil conversion rate."

"Economic conditions have not affected our maintenance."

"We are evaluating projects more critically, looking for less expensive methods, with better and more emphasis on budget control and accurate estimating."

"We are investigating the economics of staffing and maintaining company labor and equipment."

Few Restrictions

What a difference a few years makes. Unlike previous surveys, few of the utilities report any restrictions on customer attachments, and then only in special cases. Some of the comments include:

"Some restrictions on industrial."

"Yes, 100,000 Btu load minimum."

"Only on firm industrials in excess of 50 Mcfd."

"Firm loads in excess of 199 Mcfd must receive special approval in accordance with our supplier's tariff. All other firm loads accepted, no restrictions on interruptible loads."

"Any customer using more than 300 Mcfd must be interruptible, and new heating customers must meet weatherization standards set by the PUC."

Wish List

From the responses received, it appears there is a pot of gold awaiting the inventor that can come up with a method for detecting plastic pipe that has been installed without a tracer wire. That was one item mentioned over and over by utility executives who answered the question, "What three new piping products and materials would you like most to see produced or evolved from research?" Comments included:

"Plastic pipe locators."

"Improved repair fittings for large diameter plastic."

"Plastic-to-cast iron pullout resistant coupling."

"Method of locating plastic pipe integral to the pipe, not a buried wire."

"Higher operating pressures for plastic; better leak detection devices."

"Good, inexpensive, strong plastic valve."

"Chemical means of joining PE pipe and tubing."

P&GJ

Plastic Pipe Maintains Lion's Share Of Market

by Jim Watts, *Assistant Editor*

Plastic pipe dominated the distribution piping market in 1982, marking the 9th straight year plastic has accounted for more than 50% of all distribution pipe installed and for the third year in a row more than 75% of all pipe installed was plastic. In 1982, 79.9% of the 23,610 miles of new and replacement mains and services were plastic, compared to 84.2% in 1981 and 78% in 1980. For 1983, projections are for 75.2% of the 25,767 miles of new and replacement mains and services to be plastic, according to PIPELINE & GAS JOURNAL's 17th annual distribution piping survey.

Nearly all the 18,863 miles of plastic pipe installed in 1982 was polyethylene.

In 1982, 18,863 miles of plastic was installed by U.S. gas distribution utilities, with 19,371.5 miles of plastic pipe expected to be installed in 1983. As of Dec. 31, 1982, an estimated 215,494 miles of plastic gas distribution piping will be in the ground in the U.S., or 15.6% of the total network of 1,380,933 miles. Gas utilities reporting using plastic pipe in their system total 938, with 72 major users – those utilities having more than 750,000 ft (142 miles) of plastic in their system.

Plastic usage, as a percentage of all gas distribution piping installed each year, has been over 70% since 1980 and above 50% since 1974. The record is:

- 1966 . . . 12.0% was plastic
- 1967 . . . 13.5% was plastic
- 1968 . . . 16.5% was plastic
- 1969 . . . 19.0%was plastic
- 1970 . . . 21.2% was plastic
- 1971 . . . 24.9% was plastic
- 1972 . . . 31.3% was plastic
- 1973 . . . 42.2% was plastic
- 1974 . . . 50.6% was plastic
- 1975 . . . 55.8% was plastic
- 1976 . . . 54.5% was plastic
- 1977 . . . 72.2% was plastic
- 1978 . . . 66.9% was plastic
- 1979 . . . 69.8% was plastic
- 1980 . . . 78.0% was plastic
- 1981 . . . 84.2% was plastic
- 1982 . . . 79.9% was plastic
- 1983 . . . 75.2% is projected to be plastic

Of the respondents, 9% said they used no plastic at all in their system. Of those who did use plastic, 81% said they used one type exclusively. PE 2306 was the favorite of those who used only one type, with 60% saying they used PE 2306 for all their plastic piping needs. PE 3406 was the favorite of 25% of the companies who used only one type, with the others split fairly equally between PE 3306, polybutylene, PVC I and II, Aldyl A, PESDR II, and Driscopipe.

Plastic is used for mains and services by 97.5% of plastic users: 1.25% said they used plastic for mains but not services, and 1.25% said they used plastic for services but not mains. Plastic gas grill lines are used by 25% of plastic users, 16.5% say they use plastic for outdoor gas lights, and 6% say they use plastic for irrigation services. Another 10% of the companies say they have other uses as well for plastic, including inserts of iron mains and services, vents, and swimming pool heater lines.

Of the 18,863.6 miles of plastic pipe installed in 1982 by gas utilities, 47.2% was 1-in. or less. Another 35.5% was 1¼ to 2-in., 8.2% was 3-in., 7% was 4-in., and 2.1% was greater than 4-in. In 1983, projections are for 49.3% to be 1-in. or less; 32.8% will be 1¼ to 2-in.; 8.6% will be 3-in.; 7.9% will be 4-in.; and 1.4% will be larger than 4-in.

Plastic Vs. Steel

In the survey, respondents were asked if they used more plastic now than before, or more steel, and the reasons. The responses included:

"We have standardized on plastic pipe for mains and services 3-in. and smaller and 60 psi and less for the past 10 years."

"PE pipe is cheaper to buy, install, and maintain."

"We are using less steel and more plastic for economic reasons and easier construction. Use of plastic pipe results in lower requirements for side boom and hoist, fewer weldors, and no cathodic protection."

"About 50-50."

"More plastic is being used in the system because of corrosion requirements and cheaper labor costs."

"Haven't used any plastic pipe but feel that we may be forced to because steel is so high priced."

"Except for higher pressure and larger pipe size, we are using 100% plastic."

"We use all poly pipe, eliminates cathodic protection."

"We are using more plastic, mainly for corrosion protection reasons."

"Use of plastic pipe has increased efficiency of crews. It is lighter and easier to handle, and therefore requires less heavy equipment."

"More plastic, easier installation."

P&GJ

Size Of Plastic Pipe Installed By Gas Distribution Utilities

Size (inches)	% Total 1980	% Total 1981	% Total 1982	% Total est. 1983
1 and under	50.3	50.5	49.3	49.3
1¼ to 2	40.1	38.4	38.6	32.7
3	2.9	3.6	3.8	8.6
4	5.6	5.4	6.1	8.0
6 and over	1.1	2.1	2.2	1.4

1982 Gas Distribution Utility Usage Of Plastic Pipe

Type Of Installation	% Of Total
New mains	24.3
Replacement mains	22.6
New Services	26.1
Replacement Services	26.5
Other applications	0.5

International LNG Report

Future World LNG Trade Looks Good — Part 2

by P.J. Anderson, *Consulting Editor, Technology*

Projects Under Construction

Currently, two projects are under construction (Table 2). Both will deliver gas to Japanese customers. The first involves Malaysia where Malaysia LNG SDN. BHD., owned 65% by Petronas and 17.5% each by Shell and Mitsubishi, will export LNG to Tokyo Gas Co., Ltd., and The Tokyo Electric Power Co., Inc., beginning in January 1983. The second involves expansions of the two Indonesian LNG facilities. The LNG produced will be exported to Japanese customers beginning in 1984 for the expansion of the P.T. Badak facility in east Kalimantan and later in 1984 or early 1985 for the expansion of the P.T. Arun plant at Lho Seuawe, Sumatra.

With the implementation of these two projects and the achievement of full plateau volumes, the quantity of LNG in world trade will have increased to 6.67 Bcfd (65.4 billion Nm^3/yr). The volume directed toward Japan will have increased by two-thirds to a level of 3.79 Bcfd (37.2 billion Nm^3) or 57% of world trade. The share of projects directed toward Europe and the U.S. will have decreased proportionately.

Possible Projects

There are a multitude of possible projects. Some will likely be implemented, although their forms could well be different than they are currently envisioned. Other projects are destined never to be implemented. To be implemented, a project needs, among many criteria, the following:

- Sufficient, dedicated reserves
- Favorable economics
- Long-term support of the buyer and seller
- Concurrence and support of the governments involved
- Approvals of governmental authorities with jurisdictional authority
- Acceptable financing.

Ten projects have been selected for inclusion in Table 3. A brief discussion of the status of each project follows.

Australia-Japan. Phase 2, the LNG phase, of the North West Shelf Project is to commence when firm gas purchase contracts are signed with the eight Japanese buyers. Since July 1981, negotiations to complete the individual sales and purchase agreements have proceeded in a rapidly changing economic climate, in both Australia and Japan. Against this background, sellers and buyers announced a new target date of April 1987 for supply of the North West Shelf LNG, building to plateau levels in 1990.

Because of the later target date for LNG delivery, North West Shelf participants have rescheduled construction of the LNG-related facilities. This, together with the results of further appraisal work on the North Rankin reservoir, has enabled the second platform to be deferred and design work, just beginning, was suspended so that the experience obtained on North Rankin A could be incorporated. Other major items that have been affected are the LNG plant at Withnell Bay and the acquisition of the seven 125,000 m^3 capacity LNG tankers to be used to transport the liquefied gas to Japan.

Project specifications for the LNG plants have been completed by SIPM in The Hague. Studies to define outline specifications for the LNG tankers have been finalized. Total cost of the project, including the seven LNG carriers that will be required, is now estimated to be $11 billion in as-expended dollars.

Canada-Japan. There are three competing projects to export Alberta and British Columbia surplus gas to Japan. The Western LNG Project is proposed by a consortium headed by Dome Petroleum Ltd., which includes Nova Corp., and NIC Resources Inc., a wholly-owned subsidiary of Nissho Iwai Corp. This proposal calls for the export of 3 Tcf of natural gas

TABLE 2.
Under Construction Base-Load LNG Import Projects

Trade	Contract Initial Delivery	Contract Term, yr	Companies Involved	Daily Gas Volume, MMcf
Malaysia — Japan Bintulu — Japanese Terminals	1983	20	Malaysian LNG Petronas, Mitsubishi, Shell, Tokyo Gas Co., Ltd. Tokyo Electric Power Co., Ltd.	870
Indonesia — Japan East Kalimantan — Japanese Terminals (plant expansion)	1984	20	Pertamina Osaka Gas Co., Ltd. Toho Gas Co., Ltd. Kansai Electric Power Co. Chubu Electric Power Co.	460
Indonesia — Japan Arun — Japanese Terminals (plant expansion)	1984-5	20	Pertamina Tokyo Electric Power Co., Ltd. Tohoku Electric Power Co.	480

TABLE 3.
Possible Base-Load LNG Import Projects

Trade	Contract Initial Delivery	Contract Term, yr	Companies involved	Daily Gas Volume, MMcf
Australia — Japan Withnell Bay-Japanese Terminals	1987	—	Woodside Group Eight Japanese Terminals	850
Western LNG (British Columbian Gas and Alberta Gas) British Columbia — Japan	1986	20	Dome Petroleum Ltd. NIC Resource Inc. Chubu Electric Power Co. Chugoku Electric Power Co., Inc. Kyushu Electric Power Co., Inc. Osaka Gas Co. Ltd. Toho Gas Co.	400
Thailand — Japan/Korea Songkhla-Japanese or Korean Terminals	—	—	Texas Pacific Thailand Inc. PSA Group Thai Government Japanese Trading Co.	250
Qatar — Japan	1988	20	Qatar General Petroleum Co. International Petroleum Co. Japanese Trading Co.	870
U.S.S.R. — Japan Sakhalin Island — Japanese Terminals	1986	20	Soviet Union Sakhalin Oil Development Cooperation Co.	435
Indonesia — Korea Arun — Pyongtack	1987	20	Pertamina Korean Electric Power Corp.	210
Cameroons — Europe Kribi-European Terminals	1987-89	20	SOGAZCAM European Buyers	420
Canada — Europe/E. Canada (Arctic Pilot Project) Bridport Inlet, Melville Island — European or Eastern Canadian Terminals	1987	20	Petro-Canada Dome Petroleum Ltd. Nova Melville Shipping Ltd. TransCanada Pipelines Ltd. (Receiving Terminal)	260
Canada — Europe King Christian Island and Ellef Ringnes Islands-European Terminals	1990	20	TransCanada PipeLines Petro-Canada Ruhrgas A.G. Gelsenberg A.G.	510
Nigeria — Europe/U.S.	1989	—	National Nigerian Petroleum Corp. Shell Gas B.V., Agip Africa, Cie. Elf-Aquitain	840

over a 20-year period starting in 1986 to five Japanese utility companies. This project has received the support of the B.C. Provincial Government.

On the Federal level, the National Energy Board began hearings under Phase II of the Omnibus Hearings on Natural Gas Exports. Under consideration are export license applications of some 16 companies totaling 26 Tcf. Included are LNG exports to Japan. Selection of the successful applications is expected later this year or early next year.

Thailand-Japan. After over a year of pressure by proponents of gas exports, the Cabinet of Prime Minister Prem Tinsulanond's government has agreed in principle to export approximately 220 MMcfd (2.2 billion Nm^3/yr) of gas from the Gulf of Thailand. Japanese utility companies are the most likely customers; some gas could go to Korean buyers. No announcements of sales agreements have been made. The quantity approved as surplus to Thailand's needs, and available for export, was only half of the 440 MMcfd (4.4 billion Nm^3) proposed by Texas Pacific Thailand Inc. and PSA Group (a diversified Thai company). The gas-export project, as originally proposed by TP and PSA, was to export the gas from TP's "B" Structure gas complex in Block 15.

The TP-PSA proposal was to bring the gas ashore by a 125-mile subsea pipeline to a liquefaction plant near Songkhla. The gas would be liquefied at a two-train plant and exported. Based on averaged shipping distances, a four-vessel fleet of 120,000 m^3 capacity would be indicated.

Qatar-Japan/Europe. Development of a gas export project would involve production from the offshore North field. According to a DeGolyer & MacNaughton estimate, North field's reserves could be as large as 298 Tcf (8 trillion m^3), some three times the reserves of the Groningen field and, more importantly, almost 10 times Qatar's oil reserves.

Financial and technical proposals have been submitted by six companies competing for a 15% operating partnership in the project. Japanese trading companies would compete for an additional 5% share of the project. Qatar General Petroleum Corp. will hold the remaining 80% of the operating partnership.

The project, as originally planned, called for export of a projected 870 MMcfd (8.5 billion Nm^3/yr) to Japan beginning in about 1987. Exports would be for 25 years. Resistance from the trading companies to such a large volume in the Japanese market in that time frame has been reported. Consequently, the volume may be reduced or partially redirected to European buyers.

Russia-Japan. Timetable for developmental drilling offshore Sakhalin Island could be seriously affected if the U.S. maintains its sanctions against use of American technology in Soviet energy projects. Involved is a U.S. ban on use of electrical logging equipment made by Schlumberger and pipe guiding equipment now being used at two platforms drilling exploratory wells on the continental shelf on the Sea of Okhotsk.

The Sakhalin Oil Development Cooperation Co., a consortium involving government-owned Japan National Oil Corp. and 18 private companies, wants the ability to renew a $1.2 million lease to use the equipment covered by the sanctions plus the ability to purchase the required spare parts. U.S. enforcement of the ban could delay developmental drilling by up to two years.

Reserves in the area are presently estimated to be 250 million bbl of oil and 5 Tcf of gas. Under the agreement, about 70,000 bbl of oil per year, beginning in 1986, and 435 MMcfd (4.1 billion Nm^3/yr) of gas as LNG, beginning in 1988, are to be imported by the consortium.

Indonesia-Korea. A decision to import LNG was made by the Korean government in October 1980. Korean Electric Power Corp. will sponsor the project. Korea's LNG import project is reportedly to be developed in phases. The first phase, beginning in 1985, will involve the import of 210 MMcfd (2.1 billion Nm^3/yr) from Pertamina's Indonesian

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facilities. The second phase, beginning in 1987, would involve increased imports of 420 MMcfd (4.1 billion Nm^3/yr). A potential third phase, beginning in the late 1980's or early 1990's, would increase imports to a level of 530 MMcfd (6.2 billion Nm^3/yr).

Initial LNG imports would be used primarily by KECO for electric power generation. Any remaining gas would be distributed in the Seoul and Inchon areas.

LNG for the first phase would come from a one-train expansion at Pertamina's P.T. Arun facility. A one-train expansion would provide a nominal 178 MMcfd (1.75 billion Nm^3/yr) of gas as LNG.

Cameroons-Europe. Although proven recoverable reserves may be less than originally projected, 3.7 to 4.1 Tcf (100 to 110 billion Nm^3), the government is understood to be actively supporting development of an LNG export project. A consortium, Segazcam, has been formed of the State Oil Company, Societe National des Hydrocarbures (SNH), and a group of petroleum companies with gas reserves: Elf-Aquitain, Pectin, Mobil, and Total. Based on the revised reserves figures, a project of approximately 420 MMcfd (4.1 billion Nm^3/yr) would appear to be supportable. Targeted date for project implementation is 1987-89. The Tealarc mixed-refrigerant precooled cycle has been selected for the proposed plant near Kribi in southern Cameroons. Majority of the gas export is to come from the northern part of the country near Victoria and the remainder from fields near Kribi.

Canadian Arctic-Europe. The consortium of companies forming the Arctic Pilot Project (APP) may be shifting its market – for the planned 260 MMcfd (2.6 billion Nm^3/yr) project from Melville Island in the Arctic – from Eastern Canada/United States to Europe. Talks are ongoing with potential customers in France and Germany. It should become clear which market the project, slated for implementation in 1987, will serve by the end of the year. U.S. buyers are opposed to exporting the gas to Europe, claiming first right of refusal.

Hearings before NEB have been adjourned on the project pending resolution of its market.

An April 19 announcement disclosed a joint venture to develop a project to export high Arctic Island gas to Europe. Participants include TransCanada PipeLines, Petro-Canada, Ruhrgas AG, and Gelsenberg AG. Interest is held on a 33⅓% basis for each of the two Canadian partners, while the German partners share the remaining 33⅓%.

The project, as currently envisioned, would involve producing and gathering of gas from several gas fields on and around King Christian and Ellef Ringnes Islands, about 800 miles above the Arctic Circle. LNG would be liquefied and shipped some 4100 miles in Arctic Class 10 vessels of a nominal 130,000 m^3 capacity to Wilhelmshaven, Germany, where Deutsche Flussigerdgas Terminal GmbH's receiving terminal will be located. Volume of gas to be exported will be approximately 5[illegible] MMcfd (5 billion Nm^3/yr). A 20-year contract period is indicated with the price being competitive with and escalation tied to the price of competing fuels in Europe. Scheduling of project implementation is set for about 1990. Cost of the project is estimated at $C4 billion.

Nigeria-Europe/United States. Dissolution of Bonny LNG Ltd., because of withdrawal of Phillips Petroleum Worldwide Gas Ltd. and B.P. Africa Gas Co., was a disappointment even if not totally unexpected. The remaining former partners, Shell Gas B.V., Agip (Africa) and Cie. Elf-Aquitain du Gaz, and the Nigerian National Petroleum Corp. are attempting to structure a new project.

The new project, with a targeted date of 1989 quite possible, would be about 840 MMcfd (8.2 billion Nm^3/yr) or half the size of the Bonny project. The Nigerian government has undertaken a study to define that project. Its results are to be delivered to the government by year's end. Action on a project could be expected shortly thereafter. **P&GJ**

Foreign Operations Curb Profits

by Cindy Mays, *Assistant Editor, Energy Management Report*

Despite a strong showing by U.S. refining and marketing operations, the 73 oil companies responding to our survey report a 19.1 percent drop in earnings for the third quarter. Profit margin for the group fell from 6.7 percent to 5.4 percent.

Once again, those companies with a major stake in U.S. petroleum operations posted substantial increases in net income this quarter as illustrated in the 84 percent rise at Amerada Hess.

Ashland Oil's 54 percent jump was due primarily to lower priced domestic sources for crude oil, accounting for 70 percent of their refining needs, compared to 58 percent last year.

Earnings at Atlantic Richfield rose 3 percent as a result of sharply increased earnings in petroleum refining and marketing, oil production from Alaska's Kuparuk River field, and higher natural gas prices.

The combination of improved margins in Union Oil of California's refining and marketing activities and decreased dry hole and exploration expenses sent their earnings up 10.3 percent.

Aramco members, on the other hand, were hurt by their agreement to buy $34/bbl Saudi oil.

Exxon's third quarter earnings dropped 25 percent; Mobil, 36 percent; Texaco, 49 percent; and Standard Oil of California, 13 percent.

Among the major oil companies surveyed, Gulf Oil reported the biggest decline at 54 percent. The largest contributing factor was a pretax write-down of more than $100 million on chemical properties.

Standard Oil of Ohio posted a 4 percent gain in net income. Results from the company's exploration and production, and marketing and refining operations offset losses in coal, chemicals, and industrial products.

Lower crude oil prices and slumping natural gas demand overshadowed higher U.S. gas prices, resulting in a 28 percent drop in earnings at Sun Co. and a 6.1 percent decline at Shell Oil.

Pennzoil earnings were adversely affected by sharply reduced pipeline purchases of natural gas, dropping 17 percent.

Cities Service 67.8 percent decline was due mostly to an after-tax increase of $36 million in exploration costs and interest expense.

Continued pressure on refined product margins, lower crude oil and free market natural gas prices, and a soft coal market caused Dorchester Gas earnings to drop 43.1 percent.

American Petrofina's net income fell 41.4 percent because higher charges attributable to the company's expanded exploration program caused operating income from exploration and production activities to decline.

Lower demand for natural gas and related services contributed to the 8.5 percent decline in third quarter earnings for the 27 gas companies in our survey group. Profit

GAS COMPANIES THIRD QUARTER FINANCIAL REPORTS

Company	Three months ending September 30 Revenues ($000) 1982	1981	% Chg.	Earnings ($000) 1982	1981	% Chg.	Nine months ending September 30 Revenues ($000) 1982	1981	% Chg.	Earnings ($000) 1982	1981	% Chg.	Profit Margin 1982	1981
Alabama Tennessee NG	29,582	25,413	+ 16.4	1,329	1,184	+ 12.3	96,596	86,542	+ 11.6	4,316	4,135	+ 4.4	4.5	4.8
Am. Nat. Resources	528,328	529,022	- 0.1	17,756	(109)		2,275,009	2,008,168	+ 13.3	113,337	70,485	+ 60.8	5.0	3.5
ARKLA	274,586	254,726	+ 7.8	12,435	12,118	+ 2.6	1,262,669	1,137,030	+ 11.0	93,600	85,463	+ 9.5	7.4	7.5
Coastal Corp.	1,324,087	1,408,797	- 6.0	21,224	1,827	+ 1061.5	4,236,378	4,594,905	- 7.8	43,048	(22,328)		1.0	
Columbia Gas	793,086	713,683	+ 11.1	(24,725)	(148)		3,662,901	3,075,173	+ 19.1	110,494	118,912	- 7.1	3.0	3.9
Consolidated NG	498,136	360,007	+ 38.4	6,237	931	+ 569.9	2,327,315	1,927,567	+ 20.7	118,109	94,320	+ 8.2	5.1	4.9
El Paso Cos.	954,794	962,239	- 0.8	26,773	39,172	- 31.6	2,845,181	2,781,403	+ 2.3	66,162	107,848	- 38.6	2.3	3.9
ENSERCH	968,317	853,113	+ 13.5	31,300	41,613	- 24.8	2,974,242	2,509,521	+ 14.5	124,553	143,733	- 13.3	4.3	5.7
Equitable Gas	62,936	52,113	+ 20.8	2,034	1,718	+ 18.4	418,480	407,164	+ 2.8	37,100	39,904	- 7.0	8.9	9.8
Houston NG[1]	728,328	800,617	- 9.0	56,630	63,140	- 5.6	3,180,718	2,906,310	+ 9.4	262,290	238,248	+ 10.1	8.2	8.2
InterNorth	806,249	741,606	+ 8.7	13,978	27,768	- 49.7	2,980,459	2,622,201	+ 13.6	142,074	183,435	- 22.5	4.8	7.0
Kansas-Nebraska NG	109,961	109,522	+ 0.4	4,064	6,971	- 41.7	355,129	319,162	+ 11.3	17,936	18,663	- 3.9	5.1	5.9
Northwest Energy	218,311	220,177	- 0.8	(4,163)	11,975		1,002,318	924,412	+ 8.4	31,108	50,099	- 37.9	3.1	5.4
ONEOK Inc.	206,758	240,380	- 14.0	7,779	10,599	- 26.6	833,198	835,307	- 0.3	41,554	46,440	- 10.5	5.0	5.6
Pacific Lighting[2]	1,027,115	801,550	+ 28.1	22,490	27,059	- 16.9	3,208,272	2,395,361	+ 33.9	83,738	98,328	- 14.8	2.6	4.1
Panhandle Eastern	758,893	741,846	+ 2.3	48,544	56,181	- 13.6	2,511,390	2,463,025	+ 1.9	184,508	212,940	- 13.4	7.3	8.6
Peoples Energy	1,542,490	1,315,617	+ 17.2	45,952	48,210	- 4.7	161,172	161,500	- 6.4	(12,293)	(8,512)			
Pioneer Corp.	308,938	310,952	- 0.6	26,077	27,399	- 4.8	866,157	907,129	- 4.5	72,556	84,998	- 14.6	8.4	9.4
Sonat Inc.	563,054	598,891	- 6.4	48,304	38,209	+ 26.4	1,990,098	1,900,956	+ 4.7	160,640	129,029	+ 24.5	8.1	6.8
Southern Union	223,408	220,122	+ 1.5	(1,471)	69		817,318	777,587	+ 5.1	12,872	27,901	- 53.9	1.6	3.6
Texas Eastern	1,315,003	1,110,982	+ 18.4	43,275	45,521	- 4.9	4,151,625	3,283,496	+ 26.4	147,952	164,434	- 10.0	3.6	5.0
Texas Gas Trans.	650,800	610,900	+ 6.5	25,556	32,862	- 21.9	2,107,385	1,884,414	+ 11.8	83,389	102,703	- 18.3	4.0	5.5
TransCanada PipeLines	752,045	721,371	+ 4.3	49,633	38,758	+ 28.1	2,567,188	2,479,442	+ 3.5	138,931	103,072	+ 34.8	5.4	4.2
Transco	927,654	807,898	+ 14.8	30,447	28,587	+ 6.5	2,808,429	2,578,466	+ 8.9	108,302	91,057	+ 18.9	3.9	3.5
United Energy Res.	1,290,193	1,389,606	- 7.2	40,634	49,632	- 18.1	4,245,722	3,925,656	+ 8.2	159,080	158,944	+ 0.1	3.7	4.0
Westcoast Trans.	151,461	260,138	- 41.8	20,702	14,998	+ 38.0	791,326	906,426	- 12.7	58,449	48,661	+ 20.1	7.4	5.4
TOTALS	17,014,518	16,161,288	+ 5.3	572,864	626,253	- 8.5	54,563,675	49,798,432	+ 9.6	2,403,557	2,392,912	+ 0.4	4.4	4.8

[1]Three months and twelve months ended July 31. [2]Twelve months.

Company	Three months ending September 30** Revenues ($000) 1982	1981	% Chg.	Earnings* ($000) 1982	1981	% Chg.	Nine months ending September 30** Revenues ($000) 1982	1981	% Chg.	Earnings* ($000) 1982	1981	% Chg.	Profit‡ Margin 1982	1981
Adobe OAG Corp.	51,202	48,212	+ 6.2	5,761	6,060	- 4.9	154,944	133,317	+ 16.2	17,490	18,000	- 2.8	11.3	13.5
Amerada Hess	2,124,094	1,903,170	+ 11.6	80,127	43,523	+ 84.1	6,277,671	7,104,206	- 11.6	125,049	164,343	- 23.9	2.0	2.3
American Petrofina	540,121	610,747	- 11.6	12,696	21,650	- 41.4	1,723,328	1,990,945	- 13.4	39,566	57,151	- 30.8	2.3	2.9
Argo Petroleum	5,975	4,956	+ 20.6	(2,128)	555		17,004	16,110	+ 5.6	(3,538)	2,073			12 9
Ashland Oil	8,864,669	9,262,076	- 4.3	30,057	26,502	+ 13.4	2,212,229	2,526,114	- 91.2	75,819	49,279	+ 53.9	3.4	2.0
Asamera	114,662	119,527	- 4.1	977	2,542	- 61.6	321,892	338,347	- 4.9	(867)	6,692			2.0
Atlantic Richfield	6,795,462	7,076,365	- 3.9	446,884	433,532	+ 3.0	20,245,850	21,397,558	- 5.4	1,242,071	1,201,472	+ 3.4	6.1	5.6
Beard Oil	8,065	9,013	- 10.5	(885)	1,356		26,898	25,280	+ 6.4	(250)	3,851			15.2
Belco Petroleum	84,352	77,454	+ 8.9	25,230	24,088	+ 4.7	246,037	234,765	+ 4.8	76,265	71,984	+ 5.9	31.0	30.7
Callon Petroleum[1]	5,371,390	3,136,060	+ 71.3	57,471	376,912	- 84.7	16,708,000	9,291,305	+ 79.8	2,075,078	2,610,406	- 20.5	12.4	28.1
Cities Service	1,962,400	1,910,900	+ 2.7	25,000	77,600	- 67.8	5,853,100	5,781,400	+ 1.2	152,700	225,800	32.4	2.6	3.9
Commonwealth Oil Refining	21,900	258,200	- 91.5	(5,900)	(20,600)		288,100	809,400	64.4	(22,100)	(83,000)			
Consolidated OAG	16,092	12,214	- 25.6	(1,469)	2,015		30,648	36,564	- 16.2	(3,781)	5,708			15.6
Crown Central	464,815	316,196	+ 47.0	8,365	(5,189)		1,304,449	1,074,809	+ 21.4	2,418	(11,503)		0.2	
Crystal Oil	46,798	82,674	- 43.4	1,670	1,219	+ 37.0	152,924	227,826	- 32.9	(232)	274			0.1
Diamond Shamrock	733,196	820,569	- 10.6	42,272	54,401	- 22.3	2,422,040	2,503,667	- 3.3	103,347	170,423	- 39.4	4.3	6.8
Dorchester Gas	1,159,101	712,033	+ 62.8	17,812	31,287	- 43.1	353,571	230,842	+ 53.2	4,034	7,704	47.6	1.1	3.3
Dyco Petroleum	15,152	12,647	+ 19.8	4,104	3,819	+ 7.5	43,699	35,423	+ 23.4	11,935	10,368	+ 15.1	27.3	29.3
Engle Exploration[2]	965	212	+355.2	(236)	(50)		1,444	415	+248.0	(761)	(120)			
Energy Reserves Group	39,743	43,176	- 7.9	(4,859)	(4,637)		121,928	129,741	- 6.0	(16,509)	(146)			
Enstar Corp.	82,810	88,375	- 6.3	11,461	8,525	+ 34.4	262,317	259,983	+ 0.9	30,928	32,755	- 5.5	11.8	12.6
Equity Oil	5,583	6,318	- 11.6	198	1,393	- 85.8	17,340	18,759	- 7.6	1,904	4,280	- 55.5	11.0	22.8
Exxon	25,331,000	27,614,000	- 8.6	1,070,000	1,075,000	- 0.5	77,394,000	85,406,000	- 9.4	3,195,000	4,500,000	- 29.0	4.1	5.3
Felmont Oil Corp.	18,795	20,046	- 6.2	3,898	3,762	+ 3.6	58,022	56,271	+ 3.1	11,031	12,395	- 11.0	19.0	22.0
Forest Oil Corp.	40,194	37,818	+ 6.3	4,660	369	+1162.9	116,055	103,812	+ 11.8	9,900	3,597	+175.2	8.5	3.5
Freeport McMoRan	186,137	202,834	- 8.2	19,748	36,782	- 46.3	556,057	635,650	- 12.5	61,081	128,405	- 52.0	11.1	20.2
Galaxy Oil	3,829	3,552	+ 7.8	(542)	64		10,704	11,133	- 3.8	(1,954)	371			3.3
General American	85,948	94,579	- 9.1	16,299	20,911	- 22.1	256,036	268,753	- 4.7	47,819	45,564	+ 4.9	18.7	17.0
Getty Oil	3,083,766	3,267,550	- 5.6	177,854	204,931	- 13.2	9,286,618	9,778,720	- 5.0	492,763	639,636	- 23.0	5.3	6.5
Gulf Energy & Dev.	29,218	14,299	+104.3	2,306	1,777	+ 29.8	63,393	42,480	+ 49.2	3,794	5,067	- 25.1	6.0	11.9
Gulf Oil Corp.	7,538,000	7,439,000	+ 1.3	146,000	316,000	- 53.8	22,502,000	22,526,000	- 0.1	623,000	930,000	- 33.0	2.8	4.1
Hamilton Bros. Petroleum	37,197	42,797	- 13.1	4,520	3,070	+ 47.2	126,147	105,937	+ 19.1	8,863	12,444	- 28.8	7.0	11.7
Harken OAG	1,481	1,161	+ 27.6	98	33	+197.0	4,109	2,950	+ 39.3	(677)	(952)			
Holly Corp.[3]	153,895	99,515	+ 54.6	(2,150)	(1,495)		435,373	289,644	+ 50.3	5,071	274	+750.7	1.2	0.1
Howell Corp.	53,303	55,591	- 4.1	356	(902)		184,065	167,168	+ 10.1	1,909	(1,097)		1.0	
Howell Petroleum	13,234	21,366	- 38.1	1,493	1,802	- 17.1	56,931	66,195	- 14.0	6,007	5,370	+ 11.9	10.6	8.1
Inexco Oil	51,535	61,525	- 16.2	2,770	7,533	- 63.2	170,061	176,117	- 3.4	14,795	22,325	- 33.7	8.7	12.7
Lear Petroleum	54,362	45,427	+ 19.7	1,520	(840)		157,289	123,390	+ 27.5	253	2,601	- 90.3	0.2	2.1
Louisiana L&E	259,144	313,805	- 17.4	19,245	34,479	- 44.2	873,873	934,748	- 6.5	53,079	126,696	- 58.1	6.1	13.6
Mapco Inc.	489,569	512,398	- 4.5	20,236	11,332	+ 78.6	1,452,246	1,597,792	- 9.1	54,127	66,776	- 18.9	3.7	4.2
Maynard Oil	6,761	12,419	- 45.6	(340)	1,746		26,243	33,324	- 21.2	(589)	5,675			17.0
Mesa Petroleum	99,709	103,810	- 4.0	29,414	23,955	+ 22.8	303,667	308,346	- 1.5	91,233	78,259	+ 16.6	30.0	25.4
Mobil Corp.	15,534	16,788	- 7.5	323,000	506,000	- 36.2	47,727	50,492	- 5.5	959,000	1,846,000	- 48.0	20.1	36.6
Moran Energy	20,864	25,412	- 17.9	480	4,812	- 90.0	74,253	74,371	- 0.2	6,388	14,727	- 56.6	8.6	19.8
Murphy Oil	641,018	531,867	+ 20.5	43,869	41,123	+ 6.7	1,983,925	1,858,694	+ 6.7	118,952	124,548	- 4.5	6.0	6.7
Natomas	419,165	403,950	+ 3.8	(43,817)	67,926		1,214,464	1,139,656	+ 6.6	(52,367)	181,720			16.1
Noble Affiliates	94,880	101,847	- 6.8	17,718	21,918	- 19.2	317,261	282,752	+ 12.2	60,403	58,309	+ 3.6	19.0	20.6
Norris Oil	696	726	- 4.1	104	(12		2,033	2,056	- 1.1	158	(97)		7.8	
Pacific Resources	276,430	302,189	- 8.5	4,441	6,085	- 27.0	841,949	766,918	+ 9.8	2,925	7,498	- 61.0	0.3	1.0
Pennzoil Co.	563,592	668,666	- 15.7	52,488	46,445	+ 13.0	1,739,367	2,028,769	- 14.3	135,210	163,549	- 17.3	7.8	8.1
Petrol Industries Inc.	682	782	- 13.1	141	213	- 33.8	1,800	2,400	- 25.0	373	720	- 48.2	20.7	30.0
Prairie Producing Co.	6,500	8,268	- 21.4	1,227	2,050	- 40.1	20,031	22,636	- 11.5	3,402	6,028	- 43.6	17.0	26.6
Phillips Petroleum	4,002,333	3,895,148	+ 2.8	131,640	192,287	- 31.5	11,845,172	12,196,572	- 2.9	460,375	692,838	- 33.6	3.9	5.7
Quaker State	245,542	251,660	- 2.4	11,517	9,613	+ 19.8	718,789	689,736	+ 4.2	31,352	20,616	+ 52.1	4.4	3.0
Sabine Corp.	51,178	40,486	+ 26.4	5,423	6,679	- 18.8	147,716	125,921	+ 17.3	21,433	22,714	- 5.6	14.5	18.0
Shell Oil	5,090,000	5,578,000	- 8.7	442,000	471,000	- 6.1	15,037,000	16,545,000	- 9.1	1,166,000	1,242,000	- 6.1	7.7	7.5
Southland Royalty	86,803	100,758	- 13.9	7,079	6,911	+ 2.4	274,551	301,085	- 8.8	23,868	27,321	- 12.6	8.7	9.1
Southwestern Energy	12,182	9,408	+ 29.5	1,608	1,717	- 6.3	46,052	41,441	+ 11.1	8,439	9,569	- 11.8	18.3	23.1
Standard California	8,666,000	11,458,000	- 24.4	459,000	527,000	- 12.9	28,056,000	34,425,000	- 18.5	952,000	1,809,000	- 47.4	3.4	5.2
Standard Indiana	7,676,000	7,957,000	- 3.5	559,000	608,000	- 8.1	22,399,000	23,949,000	- 6.5	1,411,000	1,538,000	- 8.3	6.3	6.4
Standard Ohio	3,175,000	3,704,400	- 14.3	487,300	470,000	+ 3.7	9,387,400	10,106,500	- 7.1	1,415,200	1,469,100	- 3.7	15.1	14.5
Sun Co.	3,800,000	3,700,000	+ 2.7	152,000	210,000	- 27.6	11,800,000	11,600,000	+ 1.7	386,000	628,000	- 38.5	3.3	5.4
Sundance Oil	21,780	9,199	+136.8	(9,795)	(3,752)		72,894	22,523	+223.6	(8,096)	(7,040)			
Superior Oil	499,823	499,785		37,411	80,811	- 53.7	1,536,394	1,496,872	+ 2.6	193,119	288,066	- 33.0	12.6	19.2
Tenneco	3,780,976	3,621,310	+ 4.4	182,304	140,990	+ 29.3	11,559,295	11,293,076	+ 2.4	484,179	506,616	- 4.4	4.2	4.5
Texaco Inc.	11,800,000	14,400,000	- 18.3	303,000	589,000	- 48.7	363,300,000	44,700,000	- 18.9	975,000	1,803,000	- 46.0	2.7	4.0
Tosco Corp.	901,970	900,655	+ 0.1	22,138	19,100	+ 15.9	2,552,219	2,529,999	+ 0.8	129,355	7,516	+ 16.2	5.1	0.3
Total Petroleum N.A.	553,224	583,401	- 5.2	8,267	(9,531)		1,649,284	1,725,600	- 4.4	7,504	(48,941)		0.5	
Transcontinental Engy	11,778	25,176	- 53.2	(2,278)	2,826		46,916	71,597	- 34.5	(5,010)	7,863			11.0
Union California	2,771,700	2,908,300	4.7	212,800	193,000	+ 10.3	8,163,000	8,384,800	- 2.6	578,900	555,400	+ 4.2	7.1	6.6
Universal Resources	13,926	16,837	- 17.3	1,494	3,601	- 58.5	45,518	46,425	- 0.2	6,724	9,322	- 32.2	14.8	21.4
Wiser Oil	13,073	14,339	- 8.8	2,248	2,900	- 22.5	40,913	47,506	- 13.9	9,391	11,890	- 21.0	23.0	25.0
Woods Petroleum	19,792	16,638	+ 19.0	4,864	4,523	+ 7.5	60,960	49,069	+ 24.2	16,535	13,264	+ 24.7	27.1	27.0
TOTAL	121,307,168	128,196,562	- 5.4	5,290,664	6,541,772	- 19.1	340,827,185	363,359,672	- 6.2	18,319,244	24,448,108	- 25.1	5.4	6.7

*Earnings available to common, **Excluding non-recurring items. ‡Profit Margin=Earnings ÷ Revenues. [1]Three months ending Aug. 31 with year ending May 31. [2]Fiscal year ends Sept. 30. [3]Ends April 30.

margin fell from 4.8 percent to 4.4 percent.

The depressed economy was blamed for United Energy Resources 18.1 percent decline.

The El Paso Company reported a 31.6 percent drop in net income due to the reduction in gas market demand, reduced margins and volumes on sales of chemical products, and higher interest expense.

Columbia Gas System posted a net loss this quarter due to depressed natural gas sales, and reduced System natural gas and oil production.

Reduced customer demand for gas, increases in uncollectible accounts, and inflation were among the factors causing Peoples Energy net earnings to fall 4.7 percent.

InterNorth's net income declined 49.7 percent because of recession-depressed wholesale natural gas and petrochemical results.

Kansas-Nebraska Natural Gas earnings were adversely affected by reduced gas sales to irrigation and industrial customers and a decline in activity by their pipeline construction unit.

Consolidated Natural Gas attributes their 569 percent gain in third quarter earnings to the increase in gas sales made to non-affiliated pipelines and utilities.

Coastal Corp. reported net income of $21.2 million this quarter compared to $1.8 million last year. The increase reflects improvement in refining and marketing during the third quarter. ■

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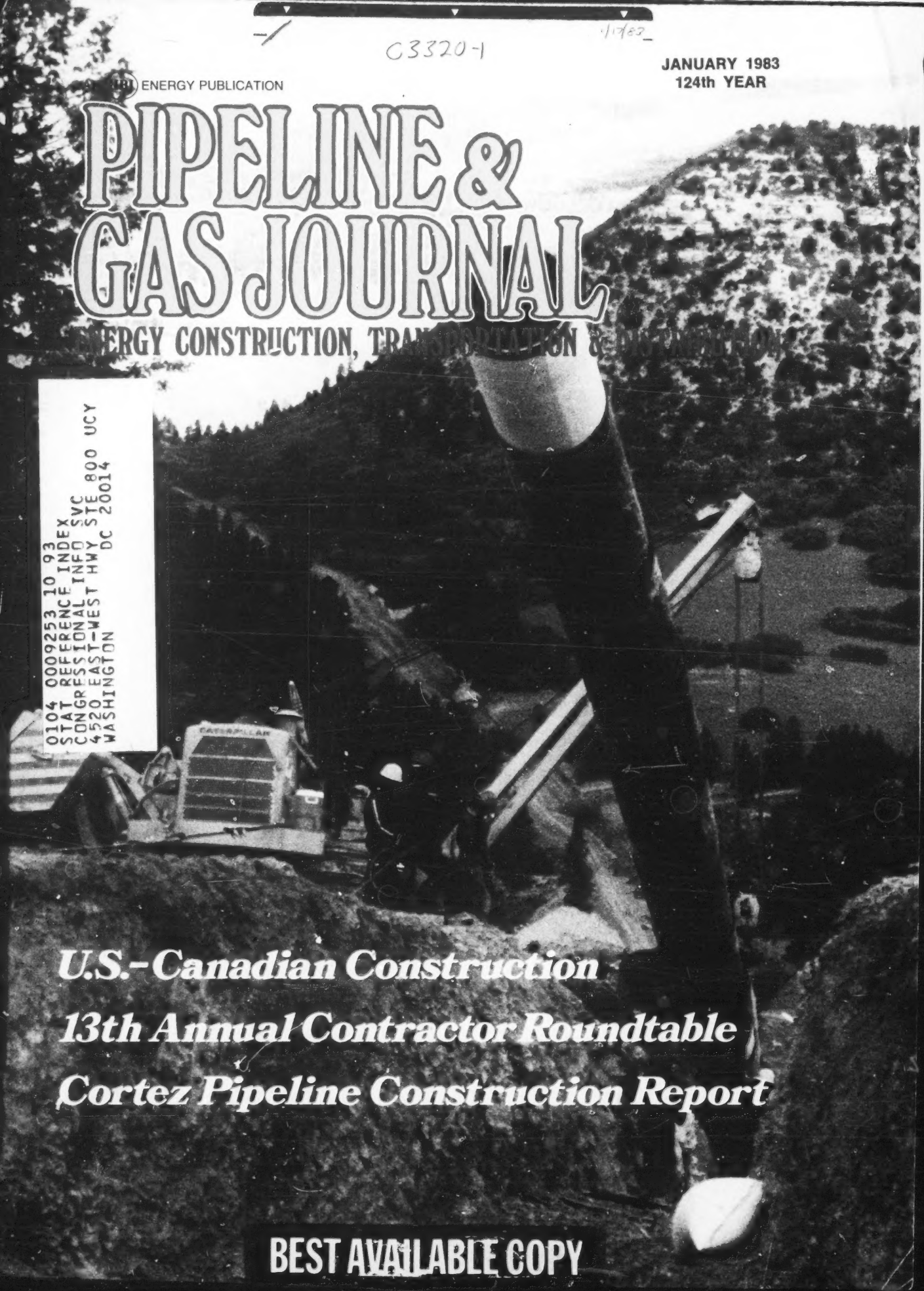

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COVER
Building pipelines up and down mountain slopes is tough and hazardous; Cherry Creek Hill, over 8000 ft elevation, was one of the highest points on the Cortez Pipeline and both pipe and equipment had to be winched up the steep incline.

–photo courtesy Willbros Energy Services Co.

Contractors Foresee Average Year In 1983; Upturn To Spur Activity 17

Most of the cross-country projects to be built in 1983 will be of small to medium-size; few major projects are contemplated now but major increase in economic activity could stimulate activity, say participants at P&GJ's 13th annual Contractors Roundtable; exclusive report provides details.

International Contractors Expect To Be Busy As World Economy Revives .. 22

During the next three years, the world's pipeline contractors (outside U.S. and Canada) expect to remain busy – and on into the 1990's... participants in P&GJ's International Contractor Roundtable say they expect changing energy supply and demand patterns to create demand for many new oil/gas pipelines.

U.S., Canada Companies Planning Nearly 47,000 Miles of New Lines 28

There are currently some 30,300 miles of new oil, gas, products, slurry, and CO_2 pipelines planned for the U.S. and 16,629 miles planned for Canada; projected construction totals are for 9412 miles in the U.S. and 1600 miles in Canada.

U.S. Pipeline Projects – Planned and Proposed 30

Tables of currently planned and proposed crude oil, refined products, gas liquids and LPG, natural gas, carbon dioxide, and coal slurry pipelines in the U.S.

Cortez CO_2 Line Masterpiece Of Planning, Innovations 36

When completed it will be the longest (505 miles), largest (30-in.), largest capacity (up to 1 Bcf per day), and, according to its builders, the heaviest, thanks to use of extra-heavy wall pipe – and it is loaded with new ideas in construction methods and equipment.

Long Range Weather Outlooks Have Good Performance Record 50

Gas Turbines Operate Successfully On Crude 54

Two large gas turbines used to drive pumps on crude oil line in North Africa have successfully operated on oil taken directly from the pipeline; in the Middle East, another 18 turbines are also operating on crude oil.

What's New In Construction Equipment .. 55

Over-Capacity, Energy Policy Will Lessen Canadian Activity 58

Two years of intensive big-inch pipeline construction have created an overcapacity in Canada that is expected to trim 1983 pipeline construction to some bare minimums; even so, some major projects continue to be studied and advanced toward the construction stage.

U.S., Canada Programs Plan For Nearly 47,000 Miles

by **Dean Hale,** *Editor,* **and Jim Watts,** *Assistant Editor*

Pipeline construction in the U.S. during 1983 is expected to be good, but certainly not spectacular, with many small and medium-size projects dominating activity, along with a healthy dose of oil and gas gathering lines in many areas.

A number of liquid and gas pipeline companies, responding to PIPELINE & GAS JOURNAL'S annual U.S. Pipeline Construction Survey, indicate that they have not yet firmed-up all of their plans for 1983. Much depends on the extent and rate of economic recovery – and the level of interest rates through the year. A growing economy, greater industrial activity, and attractive interest rates could provide a healthy boost to pipeline construction plans.

As of January 1, 1983, the number of pipeline projects planned and proposed in the U.S. totalled 30,309 miles. During 1983, an anticipated 9412 miles of new lines will be installed, including 4540 miles of oil and gas gathering lines and 4872 miles of trunk pipelines, according to P&GJ's survey.

Total of all planned and proposed projects in the U.S. and Canada is 46,938 miles. Canada, which experienced a record year in 1982 on big-inch pipeline construction, has only a few minor big-inch jobs slated for 1983 and most work will be small-inch laterals and oil/gas gathering line construction, totalling about 1600 miles *(see related article this issue).*

The 11,012 miles of new pipelines forecast for 1983 construction is less than that projected for 1982, reflecting the crosscurrents of the 1982 recession and their effect on all areas of the energy business – including pipelines.

Gas Pipelines

Over 1800 miles of big-inch pipelines built in 1982 – wrapped up in three major natural gas projects including Northern Border (270 miles), Trailblazer (790 miles), and Red River Pipeline (360 miles) plus the 400-mile Arco Sheep Mountain CO_2 pipeline – skimmed the cream from the top of the pipeline project list for the present.

Quite a few other gas pipeline projects remain on the planning boards, but it is difficult to pinpoint those that, with certainty, will see light of day in 1983. The Pathfinder Pipeline (Michigan Wisconsin Pipeline) involving 634 miles of 20 and 24-in. and costing $231 million, to transport Overthrust gas eastward, is still considered a prospect, as is the Rocky Mountain Pipeline Project, 610 miles of 34-in. to take gas from the same area to California.

Palo Duro Pipeline's proposed 240-mile, 24-in. parallel line from the Texas Panhandle to Sweetwater was postponed in 1982; new planning may see it built in 1983. In Louisiana, Faustina Pipeline plans to build 100 miles of 36-in. Florida Gas plans to install some 390 miles of 30-in. in numerous loops on its system, depending on settlement of litigation related to abandonment of its 24-in. line and sale to affiliate Transgulf Pipeline for use in products service.

Elsewhere, Panhandle Eastern Pipe Line is said to be planning some 160 miles of laterals and gathering lines; Colorado Interstate's program could embrace 300 miles of lines in 1983; Columbia Gas has plans for some 500 miles of various size lines, and Columbia Gulf Transmission is planning (with Natural Gas Pipeline Co. of America) 127 miles of offshore lines.

Carbon Dioxide Pipelines

Shell Oil's Cortez Pipeline, 503 miles of 30-in. that will transport CO_2 from southwest Colorado fields to the Denver City, Tex., area, is about one-half complete and will be completed this summer. Shell also plans some 500 miles of CO_2 delivery lines in the Denver City area. Amoco Pipeline reportedly is still planning a 350 to 400-mile line from New Mexico into West Texas, plus some 700 miles of delivery lines. Shell reportedly also is planning some 246 miles of CO_2 lines in Louisiana and Mississippi. Mobil Oil is said to be planning a 225-mile trunk CO_2 line plus field delivery lines.

Crude Oil Pipelines

Announcement in early December by Pacific Texas Pipeline Co. to build 1026 miles of 42-in. from Long Beach to Midland, Texas adds another dimension to the quest for overload transport in the U.S. for Alaskan and imported crude to inland points. Pacific Texas officials exude confidence and say the line will be built by 1986 at latest. Parallel competitor much farther north, the Northern Tier Pipeline, now controlled by Getty, has aimed its big guns at resolving the question of where the line will originate in the Port Angeles area. The 1491-mile, 40 and 42-in. line would terminate in Clearbrook, Minn. and also would transport Alaskan crude (plus imports) to inland and eastern refiners.

Other crude oil line prospects include the 290-mile, 16-in. Frontier Pipeline in Wyoming; Provident Energy's 204 miles of 16-in. in Arizona, and Four Corners Pipe Line's 300 miles of loops on its line from the Utah-Colorado-New Mexico-Arizona area to California.

Products Lines

Continental Pipe Line Co. is reported planning a 90-mile, 6-in. line in Wyoming; Seagull Pipe Line has two spreads

1983 PIPELINE OUTLOOK

Miles Planned or Proposed

Type of Line	U.S.	Canada
Natural Gas	10,684	13,604
Crude Oil	3,605	1,475
Products	2,978	700
Slurry	10,396	500
CO_2 (Carbon Dioxide)	2,646	350
TOTALS	**30,309**	**16,629**
GRAND TOTAL, U.S. AND CANADA		**46,938**

Projected Completion, Miles

Type of Line	U.S.	Canada
Natural Gas	3138	
CO_2	600	
Crude Oil	614	1600
Products	520	
Slurry	—	
Oil/Gas Gathering	4540	
TOTALS	**9412**	**1600**
GRAND TOTAL, U.S. AND CANADA		**11,012**

working on 121 miles of its planned 280-mile 6 and 8-in. system on the Texas Gulf Coast; Texas Eastman plans 53 miles between Tyler, Tex. and Shreveport, La., and Colonial Pipeline reportedly is still studying closely a 240-mile, 16-in. lateral from Augusta, Ga. to Charleston, S. C., and 190 miles of 36-in. between Baltimore and Linden, N.J.

Planned but uncertain as to start of construction are the Phillips/HTI/Mapco 820 miles of 10-in. from Williston, N.D. to Conway, Kan., and Transgulf Pipeline's 890-mile, 24-in. products system (conversion from gas pipeline) plus numerous laterals.

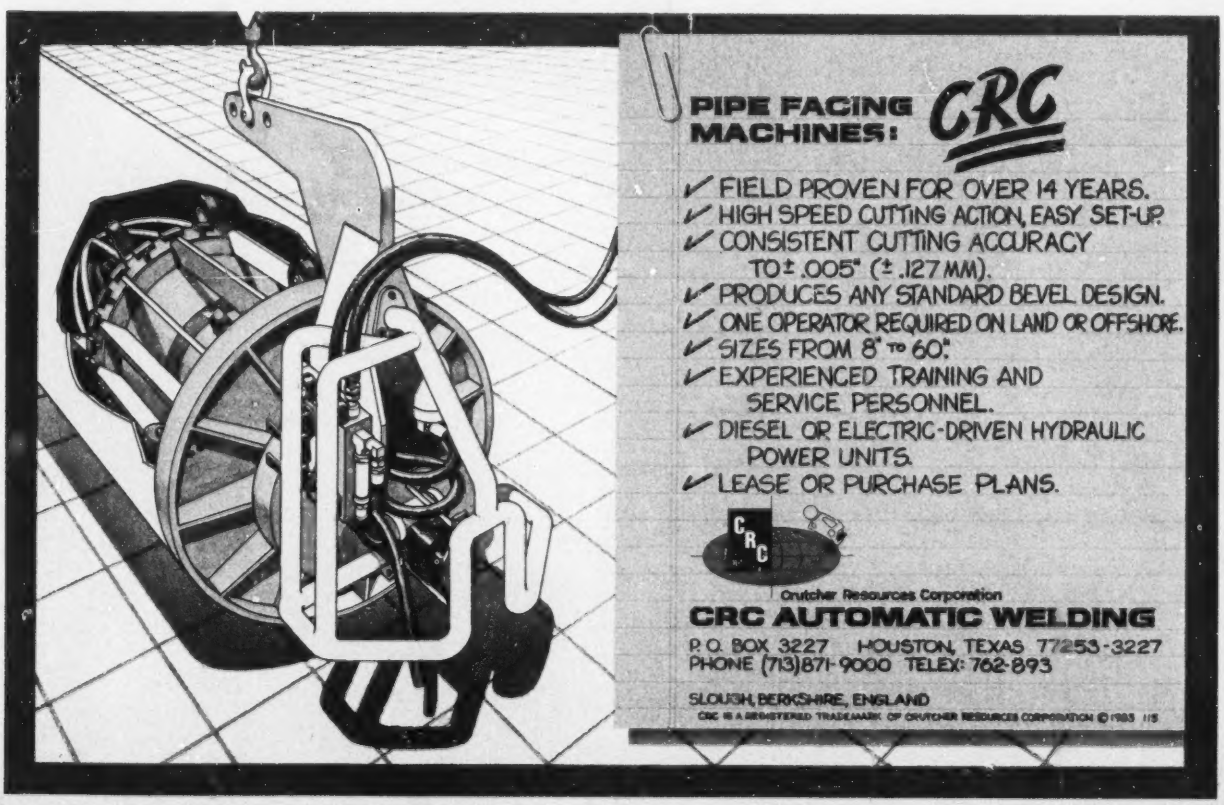
Slurry Pipelines

Biggest question in this area is: when will Energy Transportation Systems Inc.'s 1440-mile, 40-in. line begin construction? "Starting" dates have continued to slip, and latest information is that contracts might be let in 1983 with work to begin in 1984. ETSI also has some 285 miles of water pipeline in South Dakota to build as an adjunct to the coal slurry line. ETSI will be a common carrier, and reportedly, getting shippers to sign up for available capacity has slowed events.

P&GJ

U.S. — Natural Gas Pipelines

Company	Miles	Size (In.)	From	To	Cost ($Millions)	Status	Contractors/Notes
Adobe Gas Co.	80	N/A	Toole, Liberty & Hill cos., Mont.			Planned	
Air Products & Chemicals	30	10 & 12	Plaquemine, La.	Convent, La.		Planned	Ford, Bacon & Davis, engineering
Algonquin Gas Transmission	21.1	30	Lambertville, N.J. area			Planned	for storage
ANR Storage Co.	15.9	36	Kalkasta Co., Mich.	Grand Traverse Co. Mich.			
Colorado Interstate Gas Co.	300	20, 26, 30	Wyo., Colo., Kan., Okla.		145	Planned	Completion 83-84
	181.7	12, 16, 30	Cheyenne compressor station	Latigo Junction, Colo.	85.7	Planned	
Columbia Gas Transmission Co.	28.2	8	Boone, Logan & Wyoming Co., W.V.			Planned	
	25	various	Ohio, Pa., W.V.			Planned	
	26	8	Clay, Owsley, Lee & Estill Cos., Ky.			Planned	
	347	2 to 26	Ohio, N.Y., Pa., Md., Ky.			Planned	
	111	16 & 24	Pa., Orange Co., N.Y.		72	Planned	
	21	20	Monroe Ca., WV			Planned	
	22	12	Lawrence Co., PA			Planned	
	33	6 & 12	Crawford & Mercer Cos., PA				
Columbia Gulf Transmission Co.	12.9	10 to 16	Ship Shoal area, offshore La.			Planned	
	21	6 to 10	Offshore La.		9	Planned	
	11	6	Eugene Island area, offshore la.			Planned	
	5	12 & 16	Offshore La.		9.9	Planned	
	127.7	10, 12, 30	Eugene Island, West Cameron areas,	offshore La.		Planned	
	9.71	10	Vermillion area, offshore La.		4.3	Planned	
	10.1	22	Uinta Co., Utah		5	Planned	
	3.8	20	South Pass area, offshore La.		4.8	Planned	
	18.4	20	Garden Banks block 236	West Cameron B-624		Planned	Completion late 1983
Consolidated Gas Supply Corp.	7.5	20	High Island area, offshore Tex.		8.1	Planned	
	63	30	Canton, Ohio	Ohio River		Planned	
Continental Divide Pipeline Co.	162	30	Ignacio, Colo.	New Mexico	124	Planned	
Corpus Christi Oil & Gas (Tarpon Offshore Pipeline System)	250	24	North Padre Island	Sabine Pass		Planned	
Faustina Pipeline	100	36	Erath, La.	plants near Baton Rouge		Planned	
Florida Gas Transmission Co.	19	12	Putnam Co., Fla.		6.6	Planned	
	361	30	Loops on system in La., Miss., Fla.			Planned	
Galaxie Energies	22	10	Lamar & Fayette cos., Ala.			Planned	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Owner	Miles	Size (In.)	To	From	Cost $MM	Status	Contractors or Engineers; Remarks
Great Lakes Transmission Co.	365	20	Mercer Co., N.D.	Thief River Falls, Minn.		Planned	
	125	36	Minn., Mich., Wisc.			Planned	
	42.3	36	Kalkaska, Missaukee & Clare cos., Mich.			Planned	Completion 1983
	20.6	36	Michigan		17.54	Planned	Transport gas for Transco
High Island Offshore System	66	36	Offshore Tex.		101	Planned	
Houston Pipe Line Co.	40	12	Webb Co., Tex.			Planned	
Kansas-Nebraska Natural Gas Co.	26.4	16 & 20	Sand Draw, Wyo.			Planned	Completion 1983
	10	16	Freemont Co., Wyo.			Planned	Bids Out
Lone Star Producing Co.	27.5	6 & 8	Offshore Jefferson Co., Tx.	Offshore Galveston, Tx.		Planned	
Louisiana Resources Corp.	14.1	30	Vermillion Parish, La.			Planned	
	21.3	24	Cameron Parish, La.			Planned	
Memphis Gas, Light, & Water	26	6-22	Memphis, Tenn.			Planned	From coal gasification plant
MIGC Inc.	35	10	Recluse, Wyo.	Gillette, Wyo.		Planned	Comp. late 1983
MGTC	53	6	Moorecroft, Wyo.	Newcastle, Wyo.		Planned	Comp. 1983
Michigan Wisconsin Pipe Line Co.	66	36	Offshore Tex.		101	Planned	
	39	20	Offshore La.	Cameron Parish, La.	60.4	Planned	
	634	24	Fremont Co., Wyo.	Greenburg, Kan.	231	Planned	(Pathfinder Pipeline)
National Fuel Gas Supply Corp.	25	6-20	NY & Pa.			Planned	
Natural Gas Pipeline of America	120	4-10	Yuma, Sedgewick & Phillips ctys.,	Colo.		Planned	Gathering lines
	92	4, 5, 10, 12	Garden, Deuel, Cheyenne & Morrill Cos., Neb.			Planned	
	38	26 & 30	Tex., Beckham Co., Okla.			Planned	Hutchinson & Gray ctys.,
	22.8	6, 10 & 14	W. La., East Tx.		13.6	Planned	
New England States Pipe Line	350	36	New Brunswick-Maine Border	Burrillville, RI	560	Planned	Deferred
Northern Natural Gas Co.	69	4-8	Minnesota, Nebraska			Planned	
	120	4 to 12	Iowa, Nebraska, Minnesota			Planned	
	27	12	Sprayberry field Texas		4.5	Planned	1984 completion
Northwest Alaska Pipeline Co.	745	48	Prudhoe Bay	Alaska-Yukon border	10.6	Planned	Delayed till 1984-87
Northwest Pipeline Corp.	175	4-12	Moxa Arch area, SW Wyo.			Planned	Gathering lines
	80	6 & 12	Lincoln, Unita & Sweetwater ctys.,	Colo.		Planned	
	243	30, 36	Rangely, Colo.	Ignacio, Colo.	210	Planned	
	43	22	Oregon & Idaho			Planned	Loops
	40	30	Colorado			Planned	
	75	4, 6 & 8	Wyo., Colo., N.M.			Planned	
Pacific Gas & Electric	112	34	Little Cojo, Calif.	Gosford, Calif.		Planned	Deferred
Pacific Gas Transmission Co.	432	42	Idaho, Wash., Ore.		301	Planned	Looping ANGTS Western Leg—1989
Palo Duro Pipeline Co.	240	24	Texas Panhandle	Sweetwater, Tex.	96	Planned	
Panhandle Eastern Pipeline cos.	92	4, 6, 8 & 12	Weld & Adams ctys., Colo.		37.4	Planned	
	37	4, 6, 8, 10	Woods & Woodward ctys., Okla.			Planned	
	32	8 & 10	Major Co., Okla.			Planned	
Quivira Gas Co.	25	18	Eugene Island Offshore, La.	St. Mary's Parish, La.		Planned	
	24	12	Eugene Island Offshore La.			Planned	
Rocky Mountain Pipeline Co.	583	36	Sage, Wyo.	Needles, Calif.	515	Planned	
Seagull Pipeline Co.	258	12 & 24	North of Brownsville	Galveston Co.		Planned	
Southern California LNG Terminal	63	32		Ventura Co., Calif.		Planned	Deferred
Southern Natural Gas Co.	40	18	Offshore La.		9.6	Planned	
Southern States Pipeline Co.	32	12	Norco, La.	Sorrento, La.		Planned	
Southwest Gas Corp.	20	16	Mohave Co., Nev.	Arizona		Planned	Connect W/EPNG Line
Tennessee Gas Pipeline	253	10, 12, 30, 42	NY, MA, NJ, CT, NH, PA, VA		373	Planned	(Boundary Gas Project)

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Owner	Miles	Size (in.)	From	To	Cost $MM	Status	Contractors or Engineers; Remarks
Texas Eastern Corp.	29.5	30 & 36	Delmont, Pa.	Bechtelsville, NJ	39.1	Planned	
	97	30	Perulak, Pa.	Lambertville, NJ		Planned	Leidy Loops
	1	36	Perulak, Pa.				
	185	30 & 36	High Island Offshore	E. Cameron area on/offshore La.	240	Postponed	(W/Tennessee
Texas Gas Transmission Corp.	12.51	20	Eunice Compressor Sta.		12.706	Planned	Gas Pipeline)
	4.92	12	Roanoke System	Lakeside Mallard Bay		Planned	
	9.93	10	Vermillion Parish	Lakeside Mallard Bay		Planned	
Trans-Anadarko Pipeline System	635	36	Moore Co., Tex.	W. Monroe, La.	700	Planned	1st phase – approved; 468 miles
Transcontinental Gas Pipe Line Corp.	158	42	Niagara Falls	Wharton-Leidy storage area, Pa.	402.3	Planned	(Niagara Pipeline)
	28.5	12, 16, 20	Brazos & Galveston areas, offshore Tex.		29.5	Planned	W/Tennessee Gas Pipeline
	3.3	16	Ship Shoal 2388 offshore La.	UMTV block 232		Planned	Comp. 3/83
	17.4	42	MP 542.06	Atchafalaya River, St. Landry Parish, La.		Planned	Comp. 3/83 Loops
	14.2	10	Raccouri Island field, La.			Planned	Comp. 3/83
	30.6	24	McMullen Lateral, Tex.			Planned	Comp. 3/83 Loops
	23	42	SW La. Lateral	Station 45 Calcasieu & Beauregard Parishes, La.		Planned	Comp. 3/83
	6	42	Station 45	MP 473.98 Beauregard Parish, La.		Planned	Comp. 3/83
	23	36	Markham, Tex.	Intercoastal Canal Matagorda Co., Tex.		Planned	Comp. 9/83
	9.8	8 & 12	Brazos Block A-23 offshore Tex.	Brazos block A-19C		Planned	Comp. 9/83
	2.8	24	Brazos block A-19C offshore Tex.	Brazos block A-20		Planned	Comp. 9/83
	1.1	10	Brazos A-20	A-19C		Planned	Comp. 9/83
	1.8	12	High Island A-567	UMTV block A-552		Planned	Comp. 9/83
	10	20	High Island A-568	UMTV block A-552		Planned	Comp. 9/83
	12	16	Brazos A-132	UMTV A-76		Planned	Comp. 10/83
	32	3	Texas Coast	Brazos block 538		Planned	Comp. 10/83
	23	36	Markham, Wharton & Matagorda Cos., Tex.			Planned	Central Texas Loops
	1	12	Galveston 392A offshore Tex.	UMTV block 392		Planned	Completion 11/83
	230	10-42	Pa. & NJ			Planned	Loops on Leidy System
Transwestern Pipeline Co.	35.7	20	Chaves County, NM	De Baca County, NM	23.6	Planned	
	80	20 & 12	Hemphill County, Tex.	Roger Mills County, Okla.	38.1	Planned	
Valero Transmission Co.	60	36	Ft. Worth area			Planned	
Western LNG Terminal	286	42 & 48	Pt. Conception, Calif.	Los Angeles, Calif.		Planned	Deferred
Western Gas Interstate Co.	55	12	SE New Mex.	Pyote, Tex.	5.8	Planned	

U.S. — Crude Oil Pipelines

Continental Pipeline	12	18	Milne Point, Alaska	Kuparuk pipeline		Planned	Comp. 1984
Exxon Pipeline	14.3	12	Offshore Louisiana			Planned	
Four Corners Pipeline Co.	300	16 to 20	California			Planned	Bechtel (E)
Frontier Pipeline	290	16	Overthrust Belt NE Utah-SW Wyo.	Casper, Wyo.	100	Planned	
Koch Oil Co.	15	N.A.	North Dakota			Planned	
Northern Tier Pipeline	798	42	Port Angeles, Wash.	Harlowton, Mont.	1600	Planned	Butler (E) and
	693	40	Harlowton, Mont.	Clearbrook, Minn.			Williams Bros. (E).
Northville Industries	174	30	Texas City	Houston, Freeport, Nederland, Tex.		Planned	
Oil Shale Corp.	N.A.	N.A.	Wynnewood, Okla.	Duncan, Okla.	12.6	Planned	
Pacific Texas Pipeline Co.	1026	42	Long Beach, Calif.	Midland, Texas	1400	Planned	
Provident Energy Corp.	204	16	Kingman, Ariz.	Mobile, Ariz.		Planned	Brown & Root (E)
Union Oil Co. of California	18	10	East Breaks 160	High Island 536 offshore Tex.		Planned	
United Brine Pipeline Corp.	61	4	Ingleside, Tex.	Victoria, Tex.		Planned	

U.S. — Product Pipelines

Alaska Interstate, Dow Chemical, Shell Chemical	800	16-20	Prudhoe Bay	Anchorage or Valdez	1200	Planned	
Celanese Chemical	21	18	Texas			Planned	Comp. 1985
Continental Pipeline Co.	88	6	Sheridan, Wyo.	Gillette, Wyo.		Planned	
Enterprise Pipeline	23	8	Napoleonville	Geismer, La.		Planned	dual 8-in. LPG lines
	145	8	Sorrento, La.	Petal, Miss.		Planned	Const. mid-83 LPG
Doyon Ltd.	398	16 & 20	Delta Junction, Alaska	Glenallen & Nikishka, Alaska		Planned	LNG/Crude
Koch Oil Co.	30	6	Kingfisher, Okla	El Reno, Okla.		Planned	LPG
MAPCO Inc.	41	3	Texas			Planned	LPG
Phillips Petroleum	820	10	Williston, ND	Conway, Kan.		Planned	Tentative, no construction until 1984 w/MAPCO & HTI
Quivira Gas Co.	25	6	Eugene Island offshore La.	St. Mary's Parish		Planned	Condensate
Seagull Products Co.	280	6 & 8	Upper Texas Gulf Coast Sour Lake & Port Arthur	Mt. Belvieu & Baytown		Planned	Operational mid-1983
Texas Eastman	53	6	Longview, Tx.	Shreveport, La.		Planned	Conversion from gas
Transgulf Pipeline	160	undet.	La. & Fla.			Planned	Laterals off existing 24-in. to Terminals
	12	4 & 26	Fla.			Planned	Loops

U.S. — Carbon Dioxide Pipelines

Amoco Production Co.	300	24	Bravo Dome area	Permian Basin fields, Tx. & NM		Planned	
	700		Permian Basin fields			Planned	CO_2 distribution laterals
Columbia Gas Transmission	80	undet.	Indian Creek field, WV				Methane/CO_2
Mobil Pipeline	225	24	New Mexico	West Texas		Planned	
Pennzoil Production Co.	42	8	Rankin, Madison, Yazoo counties, Miss.			Planned	
Rocky Mountain CO_2	550		Western Wyoming	East Wyoming-Mont. & W. North Dakota		Planned	
Shell Oil Co.	85	20	Rankin County, Miss.	Lincoln Co., Miss.		Planned	
	161	16, 20	Lincoln County, Miss.	Weeks Island, La.		Planned	
Shell Pipe Line Co. (Cortez Pipe Line)	503	30	Cortez, Colo.	Seminole, Tex. (Wasson Field)	520	U/C	Comp. mid-83; Willbros. Energy Services